REMARKS

Claims 1-15 are pending and stand rejected as final. Claims 1 and 13 have been amended. Applicants have amended claim 1 by removing superfluous language in the preamble. Applicants have amended claim 13 to render the claim more definite by adding one word in the preamble so that proper §112 support is present. Applicants respectfully submit that the amendments to claims 1 and 13 do not create any new issues which would require any further searching and/or consideration on the part of the Examiner and thus, entry is proper. These claim amendments result in the claims being in better condition for allowance or appeal (should an appeal be necessary). Entry of these two amendments is thus respectfully requested.

A brief summary of the claimed invention is warranted. Applicants disclose and claim that a ***physical catalyst*** in a chemical reaction system can be ***augmented*** by the exposure of the reaction system to ***at least one determined frequency***. However, the claims recite not just any frequency, but rather, a very specific frequency (or combination of frequencies). The specific frequency (or combination of frequencies) to which the reaction system is exposed can, for example, ***correspond to at least one frequency that is characteristic of the catalyst***—that is to say, corresponding to the catalyst's emission or absorption spectrum. In other words, catalysis is frequency specific, and the ***frequencies desired to augment the functioning of a physical catalyst are those that are related to the emission/absorption spectrum of the physical catalyst in the reaction system***.

§102(b) REJECTION—TSUTSUI

Claims 1-4, 7-9 and 13 stand rejected under 35 USC §102(b) as being anticipated by Tsutsui et al. (US 4,287,036; "Tsutsui").

Applicants now appreciate that the remarks provided in their 28 August 2006 Response to Office Action regarding Tsutsui need to be supplemented in order to communicate to the Examiner more specifically the differences between Tsutsui and the claimed invention.

The disclosure of Tsutsui is somewhat complicated because Tsutsui uses various alternative words and phrases to describe the exact same thing(s). To assist the Examiner in understanding what Tsutsui does and does not disclose Applicants provide the Examiner with three different groups of words and phrases used by Tsutsui to describe aspects of the Tsutsui invention. Specifically, identified below, in table form, are words and phrases assembled together, as best possible, under the headings "Composition A", "Composition B" and "Composition C". These groupings, A, B and C should give the Examiner a better understanding of what Tsutsui does and does not disclose.

Composition A
Alcohol/Transition Metal Salt
(e.g., Methanol/Vanadium(III) Salt)

"catalyst precursor"	column 6, lines 18-19
"inactive oxidized state"	column 3, lines 30-31
"inactive transition metal"	column 3, line 68; col 6, line 7
"photo-reduction of an inactive transition metal ion to an active state which is quickly oxidized during the reduction desired"	column 3, lines 34-36
"transition metal atom is at a first electron state"	column 3, lines 63-64; column 7, lines 34-35
"first electron state"	column 4, lines 64-65
"soluble metal alcoholate complex"	column 3, line 62; column 7, lines 33-34
"The reaction solution may be produced by dissolving a transition metal salt in an alcohol solvent"	column 4, lines 52-53

Composition B
Alcohol/Transition Metal Salt & Multidentate & Base
(e.g., Methanol/Vanadium(III) Salt & Catechol & NaOH)

"The solution containing the metal [alcoholate] complex"	col 3, lines 65-66
"The transition metal alcoholate complex solution"	col 4, line 3; col 4, lines 16-17

Composition C
Forming V(II) (i.e., the "Active State" or the "Active Vanadium (II)")
After Irradiation of Inactive V(III)

"Active state"	col 3, line 35; col 4, line 1 (twice); col 4, line 18; col 6, line 8 (twice)
"active state of active reducing agent"	col 4, lines 67-68
"to cause the inactive transition metal to be reduced to the active state"	col 3, line 68 – col 4, line 1
"Reducing Agent"	abstract; col 2, lines 7-8; col 2, line 35; col 2, lines 65-66; col 3, lines 22-23; col 3, lines 32-33; col 3, line 44
"active reducing agent"	col 3, line 29; col 4, line 68, col 4, line 68 – col 5, line 1
"strong reducing agent"	col 1, lines 12-13; col 2, lines 23-24; col 4, line 2; col 6, line 24
"second electron state"	col 4, lines 66-67
"This second electron state is the active state of the active reducing agent"	col 4, lines 67-68
"The active vanadium (II)"	col 6, lines 24-25
"highly reactive vanadium (II)"	col 1, lines 16-17
"the consumed reactant, vanadium (II)"	col 3, line 24

DISCUSSION OF COMPOSITIONS A, B AND C OF TSUTSUI

The first general group of eight alternative phrases used by Tsutsui describes a first set of reactants that Applicants have labeled as "Composition A". The eight phrases in this group all discuss materials related ***primarily*** to an alcohol mixed with a transition metal salt. One preferred alcohol disclosed by Tsutsui is "methanol" and one preferred transition metal salt is "vanadium (III) salt". Applicants have also provided the Examiner with specific column and line numbers for these eight excerpted phrases. Specifically, for example, the phrases "catalyst precursor" (column 6, lines 18-19), "inactive oxidized state" (column 3, lines 30-31), "inactive transition metal" (column 3, line 68), "transition metal atom is at a first electron state" (column 3, lines 63-64), "soluable metal alcoholate complex" (column 3, line 62), etc., all refer generally to the mixture of an alcohol and a transition metal salt.

The second general grouping of words and phrases excerpted from Tsutsui is labeled "Composition B". Composition B is essentially the materials of Composition A that have been mixed with the additional ingredients which include a multidentate (e.g., catechol) and a base (e.g., NaOH).

A third group of eleven alternative phrases used by Tsutsui is labeled by Applicants as "Composition C". This Composition C has different attributes from either or both of "Composition A" and/or "Composition B". Specifically, the phrases grouped under "Composition C" include, for example, "active state" (col 3, line 35), "active state of active reducing agent" (col 4, lines 67-68), "reducing agent" (col 2, lines 7-8), "active reducing agent" (col 3, line 29), "strong reducing agent"(col 1, lines 12-13), "second electron state" (col 4, lines 66-67), "the active vanadium (II) (col 6, lines 24-25), etc.

Unfortunately, due to Tsutsui's own sloppy lexicography, a plurality of phrases are used to reference the same thing(s). This apparent sloppiness expectedly renders the disclosure of Tsutsui difficult to interpret without very careful reading. However, it is perfectly clear from Tsutsui that some combination of ***"Composition A" and "Composition B"*** (i.e., the "inactive transition metal"), ***when exposed to radiation results in "Composition C"*** (i.e., the "active state"). This fact becomes clear by referring to column 5, lines 37-44 of Tsutsui which are reproduced immediately below for the convenience of the Examiner:

> "Each combination of the transition-metal salt and alcohol solution will produce a transition metal alcoholate complex having a different optimum radiation wavelength ***to produce the active catalyst***. The radiation wavelength to be used should be selected with reference to the absorption,

emission and excitation spectra of the particular transition metal alcoholate complex in solution." (emphasis added)

What becomes clear from the above two groupings of Tsutsui's alternative language assembled under Compositions A and B, is that some combination of the materials referenced by the eight alternative phrases grouped together as Composition A and the two alternative phrases grouped together as Composition B (e.g., "catalyst ***precursor***", "***inactive*** oxidized state", "***inactive*** transition metal") are converted into the material(s) referred to by the various eleven phrases grouped together under "Composition C". These Composition C phrases include: "***active*** state", "reducing agent", "strong reducing agent", "***second*** electron state" and/or "the ***active*** vanadium(II)". Tsutsui clearly discloses that what causes the transition from Composition A/B (i.e., "inactive") to Composition C (i.e., "active") is the following:

an "...optimum radiation wavelength ***to produce the active catalyst.***" (emphasis added)
(see Tsutsui, column 5, line 40)

Thus, the "optimum radiation" provided by Tsutsui is expressly chosen and expressly directed at a material which is **not a physical catalyst**, contrary to Applicants' claimed invention.

Specifically, Applicants now focus on the definition of catalyst provided in Applicants' specification. Applicants did not define a ***physical*** catalyst any differently than the meaning which was well known in the art at the time of Applicants' filing. In this regard, Applicants direct the attention of the Examiner to the current specification at page 4, line 13 – page 5, line 2 which has been reproduced below for the convenience of the Examiner:

"A catalyst is a substance which alters the reaction rate of a chemical reaction without appearing in the end product. It is known that some reactions can be speeded up or controlled by the presence of substances which themselves remain unchanged after the reaction has ended. By increasing the velocity of a desired reaction relative to unwanted reactions, the formation of a desired product can be maximized compared with unwanted by-products. Often only a trace of catalyst is necessary to accelerate the reaction. Also, it has been observed that some substances, which if added in trace amounts, can slow down the rate of a reaction. This looks like the reverse of catalysis, and, in fact, substances which slow down a reaction rate have been called negative catalysts. Known catalysts go through a cycle in which they are used and regenerated so that they can be used again and again. A catalyst operates by providing another path for the reaction which can have a higher reaction rate or slower rate than available in the absence of the catalyst. At the end of the

reaction, because the catalyst can be recovered, it appears the catalyst is not involved in the reaction."

Applicants further provide below another definition of "catalyst" taken from the McGraw-Hill Dictionary of Scientific and Technical Terms, 5^{th} ed., published by McGraw-Hill, Inc., © 1994:

> "Substance that alters the velocity of a chemical reaction and may be recovered essentially unaltered in form and amount at the end of the reaction."

Applicants note that the Office Action questioned whether Applicants are trying to change the definition of "catalyst". Applicants are ***not attempting*** to change the meaning of a **physical catalyst** from that which was known and understood in the art at the time of filing Applicants' claimed invention. Applicants apologize for not making this point more clearly in their previous response. Clearly Applicants are not changing the definition of a ***physical*** catalyst, rather, it appears that Tsutsui, based on the language chosen in the Tsutsui specification may be renaming (due to sloppy lexicography) what a catalyst is or is not. In this regard, with reference to Compositions A and B discussed above herein, it is clear that the frequency of the ***inactive*** oxidized state transition metal provided by ***Tsutsui changes a "catalyst precursor" into an "active state"***. Tsutsui ***does not expose*** his chemical reaction system to, for example, at least ***one frequency of a duplicated electromagnetic spectral pattern of a physical catalyst*** (e.g., a frequency of the active state). This is to be contrasted with currently pending independent claims 1 and 13 which are reproduced, in part, immediately below:

Claim 1: "...a) determining an electromagnetic spectral pattern of said at least one physical catalyst;
b) duplicating at least one frequency of step (a)...; and
c) exposing said chemical reaction system to said at least one frequency of said duplicated electromagnetic spectral pattern thereby **augmenting said at least one physical catalyst**." (emphasis added)

and

Claim 13: "...exposing said chemical reaction system to at least one frequency selected from the group of frequencies consisting of (i) at least one frequency of a duplicated electromagnetic pattern of said at least one ***physical catalyst***, (ii) at least one harmonic frequency of a duplicated electromagnetic pattern of said at least one ***physical catalyst*** and (iii) at least one frequency which copies at least one mechanism of action of said at least one ***physical catalyst***, said exposing being sufficient to ***augment said at least one physical catalyst***." (emphasis added)

It is clear that Tsutsui is providing transition metal salt(s)/alcohol mixtures which Tsutsui labels "catalyst precursor", "inactive oxidized state", "inactive transition metal", etc., in Composition A (see table above herein) and then subjects that reactant material(s) to radiation comprising a ***frequency of said inactive material*** to create a "strong reducing agent", "active vanadium (II)", the "active state", etc. (see Composition C in the table above herein). Accordingly, while the language of Tsutsui may at first be confusing, it is clear that Tsutsui, at best, is **energizing nothing more than a reactant** (as previously argued by Applicants in their last response). The species per se, which are energized by Tsutsui (i.e., Composition A above herein), do not change the rate or velocity of the reaction (e.g., a portion of the definition of a physical catalyst). The species whose frequencies are duplicated by Tsutsui are ***inactive***, ***non-catalytic species*** (i.e., the irradiated species are not physical catalysts in the reactions disclosed by Tsutsui).

Applicants' own specification discusses traditional photochemistry techniques at page 3, line 5 – page 4, line 12, reproduced below for the convenience of the Examiner:

> "Radiant or light energy is another form of energy that may be added to the reaction medium without the negative side effects of thermal energy. Addition of radiant energy to a system produces electronically excited molecules that are capable of undergoing chemical reactions.
>
> A molecule in which all the electrons are in stable orbitals is said to be in the ground electronic state. These orbitals may be either bonding or nonbonding. If a photon of the proper energy collides with the molecule, i.e., the photon is absorbed and one of the electrons may be promoted to an unoccupied orbital of higher energy. Electronic excitation results in spatial redistribution of the valance electrons with concomitant changes in internuclear configurations. Since chemical reactions are controlled to a great extent by these factors, an electronically excited molecule undergoes a chemical reaction that may be distinctly different from those of its ground-state counterpart.
>
> The energy of a photon is defined in terms of its frequency or wavelength,
>
> $$E = hv = hc/\lambda$$
>
> where E is energy; h is Plank's constant, 6.6×10^{-34} J-sec; v is the frequency of the radiation, sec^{-1}; c is the speed of light; and λ is the wavelength of the radiation. When a photon is absorbed, all of its energy is imparted to the absorbing species. The primary act following absorption depends on the wavelength of the incident light. Photochemistry studies photons whose energies lie in the ultraviolet region (100-4000 A) and in the visible region (4000-7000 A) of the electromagnetic spectrum. Such photons are primarily a cause of electronically excited molecules.
>
> Since the molecules are imbued with electronic energy upon absorption of light, reactions occur from entirely different potential-energy surfaces from those encountered in thermally excited systems. However, there are several drawbacks of using the known techniques of photochemistry, that being, utilizing a broad

band of frequencies thereby causing unwanted side reactions, undue experimentation, and poor quantum yield."

Accordingly, Tsutsui is nothing more than traditional photochemistry, as discussed in Applicants' own specification.

Applicants also previously made reference in their August 2006 response to the related articles of Tsutsui and Schrauzer and hereby point out to the Examiner those parts of Tsutsui which support Applicants' argument that Tsutsui radiates a "catalyst precursor" and does **not** expose a reaction system to, for example, an electromagnetic pattern of at least a portion of at least one physical catalyst (please see specific language of claims 1 and 13 above herein). Thus, Tsutsui, at best, is traditional photochemistry. Specifically, please see Tsutsui's, first column, page 3243 which states "photoreduction of vanadium(III) to vanadium(II)"; and second column, page 3243 which states "Irradiation of alcoholic vanadium trichloride solutions with 313-nm light resulted in the absorption spectral changes"; and "In addition, the photoreduction of vanadium(III) to vanadium(II) was confirmed by the appearance of the characteristic vanadium(II) EPR signal". Further, no reference to Schrauzer is needed because it is clear from all the language of Tsutsui that the irradiation provided (e.g., 313nm) changes the "inactive transition metal" (e.g., Vanadium (III)) into an "active state".

It is clear that Tsutsui does not disclose each element claimed in either of independent claims 1 or 13, or any of the claims dependent thereon. Accordingly, Tsutsui is deficient as a §102 reference.

§102(e) REJECTION—MOHR

Claims 1-4, 9 and 13 were rejected under 35 USC §102(e) as being clearly anticipated by Mohr (US 6,217,712, hereinafter "Mohr"). Applicants respectfully traverse this rejection.

First, Applicants note that Mohr's filing date is October 5, 1999. This date is after Applicants' actual and effective filing date. However, Mohr is a CIP of an earlier filed Parent Application.

In reviewing the specification of Mohr's Parent Application, Applicants note that much of what has been relied on in the Office Action is not disclosed in the Parent Application and was only added by way of CIP.

However, assuming arguendo that the complete disclosure of Mohr is available to be used as prior art, Mohr is still deficient.

Applicants note the comments in the Office Action and believe that some general background information may assist the Examiner in understanding why Mohr (as well as the Parent Application) is non-enabling, with respect to the claimed invention.

Platinum is a known catalyst used for the formation of water from gasses of hydrogen (H_2) and oxygen (O_2):

$$\tfrac{1}{2}H_2 + O_2 \xrightarrow{Pt} H_2O$$

Platinum is **<u>not</u>** <u>a known catalyst for</u> **<u>dissociation of water</u>** into hydrogen and oxygen (e.g., place physical platinum into water and watch for bubbles...none appear). Rather, platinum is a catalyst which ***promotes water formation*** in the presence of H_2 and O_2 gasses (see Example 1 of Applicants' specification).

In the traditional electrochemical hydrolysis of water (e.g., that process disclosed generally in Mohr), a sufficient DC voltage is applied to ***inert electrodes*** to cause separate reactions at the anode and the cathode. Specifically, water is oxidized (i.e., electrons are removed) at the **anode** according to the following reaction:

$$2H_20 \rightarrow 0_2 + 4H^+ + 4e^-.$$

While at the **cathode,** electrons are added to the water and water is reduced according to the following reaction:

$$2H_20 + 4e^- \rightarrow 2H_2 + 4OH^-$$

Thus, at the **anode**, **oxygen gas** and hydrogen ions (protons) are produced; while at the **cathode**, **hydrogen gas** and hydroxide ions are produced.

Although many electrode materials (e.g., metals) conduct electrons with sufficient electrical potential to cause the production of desired gasses, according to the above reactions, platinum is one of the preferred electrode materials because platinum is one of the materials which is commonly known in the art to be ***substantially inert in this electrochemical hydrolysis reaction***. Other common metals which could be used as electrode materials in a hydrolysis reaction, such as copper and iron, are **<u>not</u>** ***substantially inert***. In fact, in this electrochemical hydrolysis reaction, many metals actually react with the hydrolysis reaction products (e.g., O_2, H_2, OH^-). For example, if the cathode is made from iron, a reaction with the formed hydroxide ions can occur as follows:

$$Fe^{3+} + 3OH^- \rightarrow Fe(OH)_3.$$

Further, if the anode is made from iron, the oxygen produced at the anode is capable of reacting to form various oxides of iron (e.g., Fe_2O_3, FeO) etc. Accordingly, reactive metal electrodes can consume, for example, the oxygen and hydrogen generated by hydrolysis, thus effectively decreasing the final yield of either or both of the gasses. Moreover, the reactive metal electrodes may rapidly become inactive (e.g., incapable of continued hydrolysis reaction(s)) as the metal(s) are converted to, for example, hydroxide(s) and/or oxide(s) of, for example, the reactive metal(s).

Thus, the use of an ***inert electrode*** material (e.g., ***platinum***) in a water hydrolysis reaction system is desirable because the ***inert*** electrode material does not consume the desired product gases when compared to ***reactive*** electrode materials which do consume the product gases. Further ***reactive*** electrode materials may themselves become electrolytically inactive (unable to conduct current) due to reacting with one or more reaction products in the system (e.g., react with gaseous product(s) formed at one or both electrodes).

Hence, Mohr discloses, at column 3, lines 23-30 (reproduced immediately below for the convenience of the Examiner) the electrolysis reaction as follows:

> "In the embodiment illustrated in FIGS. 1, 2, and 3, the chemical reaction is electrolysis carried out within an electrolytic cell 6. Within the cell 6 is disposed cathode 9 and anodes 8 both connected to a source of an electric current and immersed in the electrolytic substance. Preferably the ***electrolyte is water*** and the chemical reaction comprises ***electrolysis*** to increase the ***dissolved oxygen gas*** within the water as it passes through the electrolytic cell 6." (Emphasis added.)

Mohr further discloses, at column 3, lines 37-39 (reproduced immediately below):

> "In a traditional electrolysis reaction, the cathodes 9 and anodes 8 would be plated with a ***metallic catalyst such as platinum***." (Emphasis added.)

Mohr further discloses (in reference to conventional electrolysis), at column 4, lines 62-67 (reproduced immediately below):

> "If the ***platinum catalyst is not present in*** the electrolytic cell, this reaction will not be complete and ***no dissolved oxygen*** can be measured in the exit stream. As well, ***no hydrogen gas*** is measured exiting from the outlet stream. In a conventional reaction therefore, the ***platinum catalyst is absolute[ly] essential for production of these gases***." (Emphasis added).

Accordingly, Mohr clearly discloses that a ***"platinum catalyst"*** is absolutely essential in his disclosed hydrolysis reaction.

Mohr was apparently completely unaware of the known role of *inert* electrode materials (e.g., platinum) in electrochemical hydrolysis, although this scientific concept was well known in the art at the time of his invention. This concept is so well known that no references are needed by Applicant to support the same.

Mohr thus apparently redefines a "catalyst" as a material which does not change (negatively) the rate of a reaction [Mohr column 2, line 3-8]. Mohr defines his "catalyst" as "inert". This disclosure clearly flies in the face of the traditional definition of physical catalyst. Catalysts are **not inert**. Catalysts alter rates of chemical reactions, etc. Mohr is free to be his own lexicographer, however, Mohr's definition of a catalyst is substantially different from Applicants' definition (as well as traditional definitions of catalyst taken from references and textbooks). Applicants define a physical catalyst as a material that does change the rate of a reaction, while Mohr redefines a catalyst as a material that is ***inert*** and does not decrease the rate of a reaction (i.e., a double negative). Hence Mohr does not disclose the claimed invention and is deficient as a §102 reference for all of the pending claims.

Further, as previously discussed by Applicants in their previous response, assuming arguendo that the "inert catalyst" of Mohr somewhere fit the traditional and generally understood meaning of catalyst, Mohr teaches that it is desirable to use some frequency related to an electrode material (i.e., an inert electrode material), such frequency being related to some chosen nuclear magnetic resonance (NMR) spectroscopy technique. The frequency absorbed and emitted by a material via NMR varies with the strength of the magnetic field applied to the material. There are thus an infinite number of magnetic field strengths which may be applied to a material, and hence an infinite number of NMR frequencies which may be determined for a material. Mohr does not teach how to determine which of the NMR frequencies, from this infinite range of NMR frequencies, should be applied to any reaction system, including his ***inert platinum*** electrode hydrolysis system. Instead, Mohr apparently teaches that any frequency, chosen from any NMR reference source relating to platinum, may be applied [Mohr column 1, lines 61-65; column 3, lines 45-47; column 3, lines 58-61; and column 3, line 67 to column 4, line 7]. Mohr thus teaches the indiscriminate and random choice of any NMR frequency (somehow associated with platinum) from an infinite range of NMR frequencies.

Contrary to Mohr's disclosure, Applicants teach expressly at page 11, lines 5-9 the following:

"Utilizing spectroscopic instrumentation, the electromagnetic spectral pattern of the physical catalyst agent is preferably determined under conditions approximating those occurring in the chemical reaction using the physical catalyst"

Mohr does not connect the disclosed NMR frequencies to actual reaction conditions in his ***"inert catalyst"*** electrode electrolysis disclosure. Hence, Mohr is deficient as a §102 reference for all of the pending claims.

Finally, the use of radio frequency (RF) heating to cause thermodynamic dissociation of materials (radiolysis) was well known in the art at the time of Mohr's invention. Mohr's method combines one commonly known method of water dissociation (RF heating/radiolysis of water) with another commonly known method of water dissociation (electrolysis). Mohr discusses that oxygen was present in the water stream at a concentration of 7 mg/L. Upon electrolysis with an unknown electrode material, the oxygen concentration increased 9-14%. With RF heating prior to electrolysis, the oxygen concentration rose 100-185% [see e.g., Mohr, column 5, lines 52-65]. Once again, Mohr does not teach Applicants' claimed invention nor does he teach to determine, duplicate, and apply the catalyst frequency(ies) disclosed and claimed by Applicants.

Hence, Mohr is a deficient §102 reference for all of the pending claims.

§103(a) REJECTION—LICHTIN IN VIEW OF TSUTSUI

Claims 1-4, 7-13 and 15 stand rejected under §103(a) as being unpatentable over Lichtin et al. (US 4,861, 484) (hereinafter "Lichtin") in view of Tsutsui.

As previously argued by Applicants, Lichtin is nothing more than traditional photochemistry. Specifically, traditional photochemistry is discussed by Applicants in the present specification at page 3, line 5 – page 4, line 12 (reproduced above herein for the convenience of the Examiner). Lichtin discloses that his "catalyst" is "at least one transition element and a peroxide as a reaction mixture" and that "adding photoenergy to the reaction mixture" yields desirable products (see, for example, column 4, lines 65-67, reproduced below for the convenience of the Examiner):

"...a solid catalyst comprising at least one transition element and a peroxide as a reaction mixture...".

Lichtin further discusses his traditional photochemical reaction at column 12, lines 51-56, (reproduced below for the convenience of the Examiner):

> "When such incident photoenergy is added, there is substantial enhancement of organic material degradation per Einstein of incident energy above those obtainable by presently known processes which do not utilize transition element catalysts and peroxides in combination as reactants."

The Action combines the inadequate disclosure of Lichtin with the disclosure of Tsutsui. It should now be clear from the aforementioned discussion of Tsutsui herein, that Tsutsui discloses the ***irradiation of an inactive catalyst precursor.*** Accordingly, the irradiation discussed in Tsutsui at column 5, line 40 is used ***to produce the active catalyst.***

Thus, Applicants respectfully submit that Tsutsui does nothing to overcome the deficiencies of Lichtin. Both of the references disclose traditional photochemical processes, even though both use sloppy references to the word "catalyst". In view of the above remarks, and those detailed above remarks herein regarding Tsutsui, Applicants respectfully request withdrawal of the §103(a) rejection.

§103(a) REJECTION—PRATT IN VIEW OF VLADIMIROV AND CRONHEIM

Claims 1, 3, 4, 7, 8 and 10-15 stand rejected under §103(a) as being unpatentable over Pratt, Jr. (US 4,115,280; "Pratt) in view of Vladimirov (1988, abstract only) and Cronheim (1937; abstract only).

Pratt is deficient as a §102 reference for the reasons of record including the fact that Pratt uses the spectra of an entire reaction system and has not focused on, for example, an electromagnetic spectral pattern of at least one physical catalyst.

The deficiencies of Pratt are attempted to be remedied with Vladimirov and Cronheim. Applicants have previously argued that hindsight is the primary reason for combining these references. Applicants now provide these additional comments regarding the hindsight combination of references because Vladimirov is nothing more than traditional photochemistry like ***ALL*** the references of record.

Vladimirov discloses the use of a helium-neon laser to irradiate ***an inactive*** superoxide dismutase ("SOD"). In particular, the red laser light causes a photochemical change to the SOD and catalase which is hypothesized to be protonation (page 284, first paragraph, lines 2-6, reproduced below for the convenience of the Examiner):

> "...the mechanism of photoreactivation of SOD, previously inactivated at lower pH, consists of deprotonation of His-61 residue following the absorbtion of a photon by copper-histidine complex."

The specific frequency used is disclosed as being 632.8nm (see page 282, second column, sixth paragraph, lines 7-9). This frequency is disclosed as being the ***absorption maximum of the inactive enzyme*** (see page 284, first full paragraph, lines 8-12, reproduced below for the convenience of the Examiner):

> "The absorption of the complexes in long-wavelength region is pH dependent, with absorption maximum being situated at 632-633 nm at pH 5.8-6.0 and shifting to longer wave length at higher pH."

It is clear that the enzyme "SOD" is ***inactive*** in the disclosed reaction system when the ***inactive*** enzyme is subjected to radiation.

Once again, a reference (in this case Vladimirov) discloses activating an inactive component (e.g., a reactant), in this case an enzyme, to cause the enzyme to become active. This process of making an inactive component active is similar to Tsutsui where an inactive state (V(III)) is caused to be active (V(II) due to applying radiation). Clearly, irradiation of an inactive component in a reaction system (e.g., a reactant) does not correspond to the claimed invention where the reaction system is exposed to, for example, ***at least one frequency that is characteristic of the catalyst in the reaction system***. Once again, Applicants point the Examiner to the definition of a physical catalyst. Vladimirov **DOES NOT** teach irradiating a physical catalyst with, for example, at least one frequency that is characteristic of the catalyst. Rather, Vladimirov teaches irradiating an ***inactive enzyme*** to produce a catalyst.

The disclosure of Cronheim is at best a general discussion of how one might determine specific frequencies from some substance. Applicants respectfully submit that Cronheim does not remedy the deficiencies of Vladimirov or those of Pratt to render the claimed invention obvious.

Accordingly, in view of the above remarks, Applicants request removal of all of the pending rejections and/or an issuance of a Notice of Allowance. Applicants respectfully submit all of pending claims 1-15 are in condition for allowance.

Should the Examiner have any questions regarding this communication, the Examiner is invited to telephone Applicants' undersigned representative.

Respectfully submitted,

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